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Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0680 ENVIRONMENTAL MANAGEMENT

0680/21 Paper 2, maximum raw mark 80

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1 (a) (i) letter order **E**, **D**, **C**, **B**, **A**;;

All correct for two marks.
Three correct for one mark. [2]

(ii) cyclone (**E**), drought (**D**) and flood (**B**);
All three and no others for one mark. [1]

(iii) hazard plus minimal detail;
another hazard plus minimal detail;
further detail;

short-term events:
some only last a few minutes;
most are over within hours or days;
volcanoes and droughts can last longest, but often just months at most;

long-term events:
possible for some to keep happening for several years, or keep repeating themselves;
such as droughts (e.g. Sahel);
and occasionally a volcano (e.g. on Montserrat);

All three choices in the question are possible choices. [3]

(b) (i) X = destructive / convergent / converging
Y= constructive / divergent / diverging [2]

(ii) earthquakes occur at plate boundaries most tectonic activity being concentrated on plate boundaries / strongest / on top of plate boundary / epicentre;
plates are moving;
ref. ripple effect e.g. gets less moving away;
an explanation about what is happening at destructive / conservative plate boundaries which leads to earthquake formation (e.g. friction / jolting); [3]

(iii) 9.2 in 2004; [1]

(iv) 2004–2007;

includes top three years for earthquake numbers;
10 in 2005, 7 in 2004 and 6 in 2006 / 27 of the total number of 43 in this 4-year period
Accept 63%. [3]

(v) suggests that the risk is (very) high / since at least one earthquake of magnitude 6.0 or more occurred in every year / since the average in the 10-year period was more than four strong earthquakes a year; [1]

(vi) appropriate scale accurately marked on *y*-axis and *y*-axis labelled;

All plots correct using bars for two marks.
At least four correct plots for one mark. [3]

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(vii) *magnitude on Richter scale / earthquake strength:*
referring to those of exceptional strength such as the 9.2 and 8.6, and / or by referring to the logarithmic nature of Richter scale;

nature of the earthquake:
such as depth of the focus / length of ground shaking / frequency / strength of after-shocks;
low lying coastal locations are also at risk from tsunamis;

density of population:
highest in urban areas, many coastal areas;
least in mountainous areas / none in the islands of Indonesia that are not inhabited;
high density of high rise buildings increases risks to people living or visiting there;

time of day earthquake occurred:
people more alert to what is happening during the day and more likely to be able to reach open spaces;

human factors related to:
earthquake proofing of buildings;
preparations in advance (with examples such as education / food supplies / shelters / medical facilities);;
differences between rich and poor neighbourhoods in terms of house structure also in terms of inferior locations of slums on hillsides where landslides are more likely to be triggered; [5]

(c) (i) ocean location where sea-water heats up most / is warm (around the Equator);
26 / 27 °C are needed for cyclone formation;

further details about how this triggers off rising air currents / leading to condensation of water vapour / formation of towering cumulonimbus clouds / formation of deep area of low pressure; [3]

(ii) (end of summer season) when sea-water temperatures are at their highest / sea-water takes longer to heat up than land surfaces which means later than the time when the Sun is overhead; [1]

(iii) Philippines is much closer to the source area / cyclones reach the Philippines first;

further supporting use of the map such as:
location of the islands in relation to Japan and Hong Kong / or to tracks of cyclones which become more varied away from the source so that only some carry on towards Hong Kong or Japan whereas fewer miss the Philippines; [2]

(d) (i) *evidence for heavy rainfall:*
(severe) flooding (everywhere);
flash floods;
(most of the dead were) from drowning;
houses swept into rivers and out to sea; [2]

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(ii) island nature of the country so very vulnerable to effects of cyclones / cyclones happen (every year / often / regular) since one of the closest land areas to the source / comment about the way the tracks of the cyclones bend northwards; [1]

(iii) *physical factors:*
wind strength was too weak;
to trigger mobile phone text messages;
great wind strength usually expected from typhoons hitting the Philippines;
but on this occasion it was flooding which did the damage;
massive amounts of rainwater must have fallen to make the rivers flood so badly showing the force of nature;
and perhaps its non-predictability (all natural hazard events are different);
Cagayan de Oro geographical factors of steep-sided mountains:
proximity to the sea;
deforested slopes*;

human factors:
poverty meant slum houses / poor quality houses have been built;
lack of planning leads to building on sand banks in the middle of the river;
lack of money spent by government with examples such as to build shelters;
lack of flood defences;
despite previous warnings about a location between steep mountain sides and the sea;
lack of sending advance warnings;
not looking at advance weather information as would be the case in a more developed country;
lack of shelters;
deforested slopes*;
** Credit once only.*

or a mixture of the two:
can never prevent large losses of life from natural hazards;
on the other hand, most developed countries are much better prepared than was the Philippines, especially considering that typhoons are regular events and there is a known time of the year when they will occur; [7]

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2 (a) (i) accurate plots for the three percentages;
sectors correctly labelled; [2]

(ii) *lakes and rivers*
it is fresh / sweet water / does not need desalination;
easily accessible surface supplies;
widely available / widespread distribution;
reliable source / large amounts of water can be readily available;

small amount comparatively;
most at risk from pollution / problems of dirty water supply;
surface waters used as places of disposal for human wastes / ref. water-borne diseases;
in some places natural contamination as well / other hazards (dangerous animals);
may destroy habitats supported by existence of lakes and rivers;

Max. two marks.

glaciers
it is fresh water / does not need desalination;
clean water supply;
more water released in summer when often it is most needed;
very extensive supply (biggest reservoir of fresh water on Earth) / supplies some of the world's major surface rivers (e.g. Ganges);

located in some of the most inaccessible places away from people;
winter freezing can cut off supplies to people;
store decreasing as mountain glaciers are melting;

Max. two marks. [4]

(iii) *possible labels:*
rainwater to fill the aquifer;
arrows or labels to show water seeping underground through the aquifer;
aquifer labelled as permeable or porous rock either in key or on diagram;
impermeable (impervious) rock labelled in key or on diagram;
(limestone / sandstone / chalk / shale) in correct place in key or on diagram;
(granite / marble / basalt / slate) in correct place in key or on diagram;
additional labelling about impermeable acting as a water trap for the permeable;
labelling for folding of rocks / downfold / syncline; [3]

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(iv) contamination by terrestrial activities;
ref. pollution control measures;

running out of water in the aquifer, use > replenishment;
ref. water conservation measures;

collapse of ground;
constructing buildings / dykes to take account / recharge of aquifer;

saltwater intrusion in coastal sites;
water conservation;

overexploitation leads to less water elsewhere / other countries / ref. to conflict;
political discourse / agreement;

ref. engineering problems / cost of drilling / hard to extract;
aid for money / expertise from outside;

At least two marks needed from each of problems and from solutions. [6]

(b) (i) *high water stress:*
Asia, because it has about 59–60% of total world population for 35–38% of world's water resources.
Europe with 12–14% of population for 7–9% of water.

low water stress:
South America, because it has only 5–6% of the world population for 25–27% of the world's water resources.
Oceania, because it has only 1–2% of population for 5–6%.
N and C America it has only 5–7% of population for 15%.

Asia / Europe and South America / Oceania / N and C America;
use of supporting values for each;; [3]

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(ii) *physical reasons:*
Africa hotter climates on average;
more evaporation / less precipitation effectiveness;

continent has varied distribution of rainfall;
large areas / many countries with a hot desert climate (e.g. Sahara desert);

e.g. Sahel noted for droughts;
and unreliable precipitation from year to year;
O.R.A. for Europe.

human reasons:
lower levels of economic development in Africa;
developing countries less able to afford to manage their water resources by dam building / river control / water transfer / extraction from underground sources / desalination;

the biggest use of water in Africa is for agriculture;
irrigation not needed as much in the cooler climates of Europe because economies are less agriculture dependent;
O.R.A. for Europe.

One mark for identifying a reason. Second mark for elaboration / development / exemplification. [4]

(c) (i) sea-water is (forced) through (thousands) of fine membranes (to take out the salt). [1]

(ii) *suggestions include:*
a lot of energy is needed;
so cost of fuel used since fuel costs in the oil producing countries of the Middle East will be lower;
lower percentage of salt in sea-water in some locations;
such as near river mouths, so that less energy is used for its separation;
costs involved in importing technology / skilled personnel;
developing countries may need to import technology / skilled personnel;
economy of scale argument;

One suggestion with some elaboration or two suggestions for two marks. [2]

(iii) (very) expensive;
more expensive than obtaining fresh water from rivers and aquifers;
cheapest desalination is 1 $US compared with only 20 cents for rivers;
desalination can cost as much as 5 $US making it 25 times more expensive;
comment stressing the massive size of the difference meaning that desalination will only be used where surface and groundwater supplies are inadequate; [2]

(iv) 38% circled or otherwise clearly identified; [1]

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(v) they can afford it;
lots of (valuable) oil;
rich in energy sources;
oil / gas;

few / no alternative supplies / not water rich;
as desert countries;

population centres are close to the coast;
sea-water is available;

increasing demand for water;
as rapid population growth / increased standard of living / urbanisation / tourism; [3]

(vi) *increase unlikely:*
can be justified by reference to massive costs;

in an era of rising world energy costs / future energy crisis;
likely to be increased only in countries where the water need is great and nothing cheaper is available;

increase likely:
in response to increased world need for water;

due to rising world populations;
rising standards of living;
leading to increased consumption of water per head;
as (energy prices fall / alternative energy becomes available) will be more likely;
more food output to feed world's people will need more irrigation water;
desalination might be the only local / national alternative, despite its costs; [2]

(d) (i) most likely answer is to refer to water-efficient methods of irrigation, such as:

trickle drip irrigation;
root zone / clay pot irrigation;
the method described emphasising how the water is targeted at plant roots;
calculate water need of crop and just use that / not water excessively;
to reduce wastes by seepage and evaporation;
changing crops to ones which need less water for successful growth / increased use of drought resistant varieties / saline tolerant plants;
water re use / reclamation / recycling; [3]

(ii) salination;
leaching (of minerals) / infertile;
eutrophication;
reduced river flow downstream from usage area;
loss of wetland habitat;
loss of biodiversity;
waterlogged;

Credit one development mark for any of these. [4]

[Total: 80]

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